

Remarks

Applicant has made an attempt to amend the specification and claims in accordance with the Examiner's suggestions, which are greatly appreciated. In particular, the Substitute Amendment is being filed in response to the Office Action of May 1, 2003, which included a Notice of Non-Compliant Amendment. Applicant has made a sincere attempt to comply in all respects with 37 CFR §1.171. Applicant also wishes to thank the Examiner for providing the undersigned with helpful suggestions regarding underlining and bracketing of the amended claims and portions of the Specification.

It is believed that the new oath previously submitted overcomes the objection of Claims 1, 3-10 and 17-13, as being based on a defective oath. Specifically, the new oath recites that the at least one error as being the language in Claim 7 regarding "the improvement comprising a current--of the aeration chamber". Claim 7 of the Patent as issued was defective in claiming "a current" as opposed to a method of creating the current and therefore failed to point out and distinctly claim Applicant's invention as required by §112.

With respect to rejection of Claim 3 under §112, cancellation of the claim renders this rejection moot. As to the rejection of Claims 18 and 19 under §112, it is believed that newly presented Claims 32 and 33 overcome this rejection.

Applicant has amended Claims 1, 7, 9 and 10 to recite that the side wall of the vessel is substantially cylindrical. This is to take into account that the vessels, in certain cases, are produced in one piece molds and, to be released from the mold, must have a slight taper. However, the slight taper, which is only a function of the manufacturing process, does not interfere with Applicant's claimed invention, to-wit: creating the claimed current pattern. Moreover, note that the patent in

reissue never called for a perfectly cylindrical vessel and, as recited in Column 4, lines 41-43, in a preferred embodiment, included a cylindrical tank. Commensurate with the change regarding the wording "substantially cylindrical," Applicant has also amended the claims to recite that the first component of the current pattern flows in a direction "adjacent" to the side wall as opposed to "parallel to," since it is obvious that if the walls are not perfectly cylindrical the current pattern would not be parallel to the side wall. It is respectfully submitted that no new matter or any substantive change to the claims has been effected.

Turning to the art rejections, Claims 1 and 3 stand rejected under 35 U.S.C. §102(e) as being anticipated by USP 5766459 to Adams ("Adams"). The rejection is respectfully traversed. In particular, applicant respectfully disagrees with the Examiner's position that Adams teaches that there is sufficient aeration gas flow or that the "differential imbalance arrangement of the diffused air aeration system" maintains all solids suspended within the plant. Read in its best light, Adams teaches in Column 3, Lines 19 et seq, that when diffused air aeration is used to induce a horizontal sweep velocity by way of a differential imbalance arrangement of the diffused air aeration system the returned sludge is swept from the settling chamber throat and sludge return opening. That is far from a teaching that all of the solids are maintained in suspension in the aeration chamber, by virtue of this air sweep. A fair reading of Adams is that the induced sweep velocity, in and of itself, would be insufficient to reduce sludge buildups.

The thrust of the Adams' invention is that one must induce a downward sludge velocity through the center well together to overcome the natural settling velocity induced by gravity alone. Note that in Column 4, Lines 3-9, it is taught that the key feature of the invention is the induced downward sludge velocity and that the recycle flow of wastewater provided by the air lift pump

through recycle conduit (140) into the center well (142) to induce the downward velocity of sludge is the key to the invention. Thus, Adams is inapposite.

The fact that Adams teaches that the horizontal sweep velocity prevents settling under the clarifier in no way anticipates or even renders obvious Applicant's Claim 1. More to the point, and per the express teachings of Adams, for the Adams system to work, there must be a combination of the sweep velocity under the clarifier *and* an induced downward velocity of sludge through the settling chamber. Stated differently, Adams does not rely on an induced current pattern as set forth in Claim 1 to (a) eliminate settling of solids below the clarifier and (b) ensure that all solids stay suspended in the aeration chamber. With respect to this latter point, there is absolutely no teaching or suggestion in Adams that Applicant's claimed current pattern is achieved. Claim 1, *inter alia*, calls for a current pattern that commences at an area adjacent the intersection of the bottom and side walls of the vessels, moves upwardly, adjacent to the side wall of the vessel, splits into second and third components that flow in opposite directions around the partition which define the clarifier chamber, forms a fourth component that flows along the opposite side to the bottom, forms a fifth component that flows across the bottom under the opening to the clarifier chamber and then forms sixth and seventh components that flow in opposite directions adjacent to bottom wall of the vessel. In other words, Applicant's current flow under the bottom of the clarifier does not occur by inducing the horizontal sweep under the clarifier using a line of imbalanced air nozzles or diffusers. Rather, the current path under the clarifier is the result of a current pattern which starts in the area adjacent to the bottom and side walls and then follows the current pattern described above. Clearly, Adams does not anticipate Claim 1.

Claims 1, 3, 4, 5, 7, 8, 9, 10, 17-19, 20-24, 25-27, and 29-31 stand rejected as being obvious in view of McKinney '470 alone or in view of Adams '459. The rejection is respectfully traversed.

To begin with, and as recognized by the Examiner, McKinney '470 does not disclose a substantially flat bottom vessel. Rather, McKinney '470 discloses and teaches a deflector (27) positioned below the clarifier. While McKinney '470 contains no teaching of the purpose of the deflector, the most realistic purpose is to deflect solids settling out of the clarifier chamber back into the aeration chamber for further bacterial digestion. As the Examiner has pointed out, this is disclosed in the patent in re-examination in Column 2, Lines 3-10. Realistically, it would appear that the deflector (27) would serve no other purpose other than to prevent solids from settling below the clarifier. McKinney '470 recognizes the problem to be solved, i.e., prevent solids which are undigested from settling in a dead zone below the clarifier inlet. However, McKinney's solution to that problem is to provide a deflector, i.e., deflector (27). There is no recognition in McKinney '470 any other means of solving the problem of solids settling below the clarifier inlet. The Examiner has taken the position, based on the cited lines of the patent in reissue that the deflector is merely optional. That is not what McKinney '470 teaches. There is no suggestion in McKinney '470 that the deflector (27) could be dispensed with to provide a flat bottom surface in the vessel. It is respectfully submitted that McKinney '470 must be construed in accordance with what it teaches and not in accordance with which another patent, i.e., the patent in reissue teaches. Furthermore, it is respectfully submitted that the Examiner is placing far more emphasis on the word "may" in the cited lines of the reissue patent than what is warranted. If the treatment plant of the McKinney '470 Patent were modified to remove the deflector (27) the plant would probably still function, albeit it less efficiently, because of the buildup of solids below the clarifier inlet. That does not mean that the express teachings of the McKinney '470 Patent can be ignored. McKinney '470 does not teach or suggest

that the deflector (27) is merely optional. Clearly, McKinney '470 does not render any of Applicant's claims obvious.

The Examiner has also taken the position that it would have been obvious to omit the deflector from the McKinney '470 design because Adams teaches the desirability of inducing a horizontal sweep across the bottom to prevent sludge buildup. Applicant agrees with the Examiner that Adams and the patent in reissue recognize the problem of solids settling below the clarifier mouth. Indeed, McKinney '470 implicitly recognizes that problem by the incorporation of the deflector (27). The issue is, how is that problem to be solved? McKinney '470 solves it by incorporating the deflector (27) below the clarifier. Adams solves it by inducing a horizontal sweep with a series of in-line differential pressure diffusers. Neither of those solutions suggest Applicant's claimed method. Specifically, neither McKinney '470 nor Adams teaches the unique and unobvious technique of providing an aeration area at a point closely adjacent the bottom and the side wall of the vessel to induce an upwardly flowing current which then follows the current pattern described in the claims, the pattern ultimately including a current path which sweeps across the bottom of the vessel underneath the clarifier to remove settling solids. Nowhere in McKinney '470 or Adams is there any teaching or suggestion to use Applicant's claimed apparatus and method which, albeit it simple, is clearly unique and unobvious. The attempt to combine the teachings of McKinney '470 and Adams to render Applicant's claims obvious involves a total redesign of both McKinney '470 and Adams. As pointed out above, the key to the Adams invention, as expressed in the Adams' Patent, is the induced downward sludge velocity provided by recycled conduit (140) terminating in the center well provided by flume (142). (See Column 4, Lines 3-5). Adams must thus use the in-line differential sweep to prevent solids from settling below the clarifier. Adams does not remotely

suggest that a single aeration source adjacent the intersection of the side wall and the bottom would be of any effect and it is clear that the downward induced velocity would undoubtedly set up current patterns not remotely resembling that created by Applicant's invention. It is respectfully submitted that a reconstruction of Applicant's method and apparatus by at least partially dismantling the apparatus of the McKinney '470 Patent and selecting an isolated portion of Adams is a forbidden foray into hindsight analysis. It is respectfully submitted that the combination of Adams and McKinney '470 does not render Applicant's claims obvious.

The Examiner has placed much emphasis on the theory that during the period in which one of the two diffusers is taken off-line by closure of valve (42) or (44), the aeration system would provide sufficient re-circulation flow, such that all solids suspended within the plant or forced into circulation. Thus, the Examiner concludes that inherently during shutoff of one of the two diffusers, at least a portion of Applicant's claimed current pattern would be induced. The Examiner also recognizes that it is unclear, under those assumed circumstances, if the current pattern would have a fifth component that flows across the bottom under the opening to the clarifier chamber. More specifically, and as shown by the drawings provided by the Examiner in the Office Action, it is unclear if a current component rises up over a portion of the deflector (27) and back down the opposite side without being swept up into the clarifier as shown in Fig. 1, or whether the current would split as shown in Fig. 2 such that there was no current flow under the clarifier. Applicant respectfully submits that the Examiner's analysis that the more likely scenario is that any current which impacted on the deflector would be swept up into the clarifier is correct. In point of fact, what the current flow would be with the deflector present, is rank speculation since there is no teaching in McKinney '470 on that issue. Indeed, there is no teaching in McKinney '470 regarding any

current flow, vis-a-vis Applicant's claimed invention. In short, the presence of the deflector (27) in McKinney '470 effectively forecloses any realistic analysis of what kind of current flow would exist if, in fact, there were only one diffuser in the apparatus in McKinney '470.

With respect to this latter point, the Examiner takes the position that inherently during shutoff of one of the diffusers, the other must be operating and, therefore, rather than having two aeration areas at 180° to one another, there is only one aeration area. In Column 3, Lines 3-10 of McKinney '470, it is stated that when a diffuser plugs up or needs to be replaced, it is pulled out of the tank and a new or repair hose is reinserted and connected to the valve manifold. From this the Examiner assumes that when the defective diffuser has been removed the other diffuser is operative. However, unless in this circumstance the valve to the defective diffuser is closed, a fact which is not taught in McKinney '470, there will be no air going through the diffuser still in the tank, as it will all be flowing out of the outlet from the manifold from which the defective diffuser has been removed. It is clear from the Office Action that the Examiner has a keen understanding of hydraulics and will readily recognize that unless the valve to the defective aerator is totally shut off, all air will escape out of that connection in the valve manifold and no air will be delivered to the aerator still positioned in the vessel. Stated differently, if air has two paths to follow, one having resistance and the other having no resistance, it will follow the path where there is no resistance, i.e., it will go out the path of the disconnected aerator and not the path of the aerator still in place in the vessel where it would have to overcome the hydrostatic head in the tank.

The fact of the matter is that there is no way that McKinney '470 alone or in combination with Adams can be applied to render Applicant's claims obvious without redesigning the apparatus

of McKinney '470 in a manner which employs the teachings of Applicant's patent in reissue. It is respectfully submitted and all claims are patentable over McKinney '470 alone or in view of Adams.

Claim 17, 19, 21, 22 and 24 stand rejected under 35 U.S.C. §112, first paragraph as failing to describe the claimed subject matter in such a way as to enable one's skilled in the art to which it pertains, or with which it is most nearly connected, to make and or use the invention characterized by the desired current pattern generated by multiple diffusers. In support of this proposition, the Examiner relies on Ex parte Forman, 230 USPQ 546 (BOPA1 1986).

The basic thrust of the Examiner's position is that it would require undue experimentation for the skilled artisan to employ multiple diffusers for reasons stated on pages 17-21 of the Office Action. As to one of the Forman factors, Applicant agrees with the Examiner that the level of skill in this art is relatively low compared to other more technically developed arts such as high temperature and pressure chemical reaction, engineering and chemical reactive design. In point of fact, it is not complicated to determine whether the claimed flow pattern is achieved with Applicant's invention.

When Applicant developed the invention of the patent in reissue, he took an existing commercial vessel, i.e., one with a cylindrical wall and a flat bottom, and cut a window in the side so that he could observe movement of any suspended solids in the vessel when the aerator was turned on. Applicant then introduced shreds of toilet tissue into the vessel. With one aerator in the vessel positioned closely adjacent the intersection of the side wall and the bottom, Applicant observed that the shreds of toilet tissue moved in accordance with the claimed current pattern. The movement of the shreds could also be viewed by raising the top cover and looking down through the clarifier. In this case, Applicant observed the shreds moving across the bottom of the vessel under

the mouth of the clarifier. Applicant then took two aerators and positioned them in the tank in close proximity to one another and then slowly separated the two aerators until the current pattern was no longer observed. In other words, Applicant simply visually determined the degree to which the two aerators could be separated circumferentially and the desired current pattern still achieved. In this regard, and as the Examiner doubtless knows, the precise distance at which the two aerators can be separated is a function of the size of the tank. Nonetheless, for any given size tank employing multiple aerators, the maximum distance that the aerators can be displaced from one another and the desired current pattern still achieved can be readily ascertained by the above method.

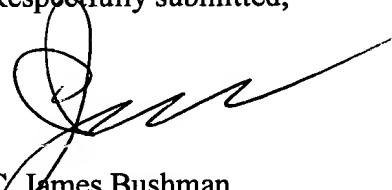
Another simple method which Applicant employed to observe the current pattern and more specifically the current action under the clarifier mouth was to remove the top cover, and insert a pole with a string tied to one end down through the middle of the clarifier, such that the end of the pole having the string attached thereto was several inches off the bottom of the vessel. Without the aeration system turned on, the string was simply limp in the water. However, very soon after the aeration system was turned on, Applicant noted that the string assumed a virtually straight line position with a flagging motion in a direction towards the aeration source verifying that a current component was moving under the clarifier in accordance with the description above and as set forth in the claims. As in the case described above with the use of shreds of toilet tissue, two aerators could be employed and circumferentially displaced from one another until the flagging motion of the string ceased, meaning that the aerators were too widely spaced.

In short, sophisticated mathematical calculations, computer modeling or the like is not necessary. Indeed, what could be simpler than the above described experiments? It is respectfully

submitted that the skilled artisan would not have to resort to undue experimentation to determine that multiple diffusers, properly positioned would provide Applicant's claimed current pattern.

In view of the foregoing amendments, remarks and submission of the new oath, it is respectfully submitted that all claims are in condition for allowance which is hereby earnestly solicited and respectfully requested.

Respectfully submitted,

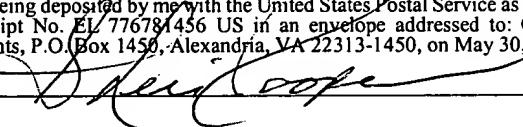

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CERTIFICATE OF MAILING

I, Sheri Cooper, hereby certify that this correspondence and all referenced enclosures are being deposited by me with the United States Postal Service as Express Mail with Receipt No. EL 776784456 US in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on May 30, 2003.

By: 

Version With Markings to Show Changes Made

IN THE SPECIFICATION

In column 5, please amend the paragraph beginning at line 12 as follows:

The defined current or circulation pattern produced by this embodiment, as shown in FIG. 1, is such that oxygenation gas forces the fluid within the aeration chamber to move upwards in direction 100 from the diffuser until it reaches the surface of the liquid within the chamber. This forces a current which travels around the conical partition in both directions, as indicated by the numbers 102 and 104. As these currents meet on the opposite side of the partition, the intersection of the outer currents causes a downwardly flowing current 106 which flows to the bottom of the aeration chamber which creates main currents 108, 110, and 112 that sweep across the bottom in all directions. The water sweeping generally in a straight line across the bottom of the vessel in direction 108 moves with the greatest speed and serves to move any solid falling out of the clarifier chamber back into circulation in the aeration chamber, thus preventing any accumulation of solids in the bottom of the aeration chamber. The water moving generally around the outer perimeter of the vessel in directions 110 and 112 moves at a slower speed but with enough speed to scour the edges of the vessel and to sweep the solids into circulation. All areas of the bottom of the vessel are forced into

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circulation. Those areas intermediate between the path straight across the bottom of the vessel and the path around the outer perimeter travel respectively intermediate speeds. While FIG. 1 shows the entire circulation pattern, FIG. 5-7 show different views of parts of this pattern. As depicted in Figs. 1 and 6, the injection system generates an area of aerating bubbles adjacent the intersection of the side wall and the bottom wall that induces the current flow shown in Figs. 1 and 6. Thus, assuming that direction 100 in Fig. 1 depicts the current flow of the wastewater induced at an injection area adjacent the intersection of the side wall and the bottom wall of the aeration chamber, a branched current having runs indicated by 102 and 104 is produced. Accordingly, multiple diffuses could be positioned in sufficient proximity to one another such that the current or circulation pattern depicted in Fig. 5 is achieved.

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IN THE CLAIMS

Kindly amend Claims 1, 4, 7, 9 and 10 as follows:

1. **(Thric'e Amended)** In an aerobic wastewater treatment plant comprising:

a vessel defining an aeration chamber and having a substantially flat bottom wall and a substantially cylindrical side wall,

said aeration chamber containing aerobic bacteria into which wastewater containing organic solids flows to be exposed to aerobic bacteria to [convert] aerobically digest the organic solids in the wastewater [to water and CO₂, said aeration chamber having a bottom and side walls],

[means for injecting an oxygenation gas into the wastewater,]

an aeration system in the aeration chamber to support growth of the aerobic bacteria, and

a clarifier chamber formed in said vessel and into which wastewater from the aeration chamber flows upwardly toward an outlet pipe through which the wastewater flows from the wastewater treatment plant, said clarifier chamber being defined by a partition in the form of an inverted, truncated cone into the bottom of which the wastewater flows from the aeration chamber,

the improvement [comprising a diffuser for releasing the oxygenation gas as bubbles into the]

wherein said aeration [chamber of the wastewater treatment plant] system forms an aeration area adjacent the intersection of the bottom and side wall of the vessel and [said diffuser providing] provides sufficient flow such that all solids suspended within the plant are forced into circulation, said [diffuser being placed close to the bottom of the aeration chamber of the wastewater treatment plant and close to the side wall of the aeration chamber] aeration system [diffuser] providing sufficient oxygenation gas to allow the aerobic bacteria to [allow the aerobic bacteria to convert] digest the organic solids in the wastewater [into CO₂ and water] and a current pattern having at least

one first component flowing upwardly in a direction perpendicular to the bottom wall of the vessel and adjacent to the side wall of the vessel, second and third components that flow in opposite directions around the partition which defines the clarifier chamber, a fourth component that flows along the opposite side wall to the bottom, a fifth component that flows across the bottom under the opening to the clarifier chamber, and sixth and seventh components that flow in opposite directions adjacent the bottom wall of the vessel.

4. (Amended) The wastewater treatment plant of Claim [1]3 wherein said oxygenation gas injecting means further comprises:

a drop line having a first end attached to an external oxygenation source and a second end open to dispense oxygenation gas received from the external oxygenation gas source, said second end being attached to said diffuser.

7. (Thrice Amended) In an aerobic wastewater treatment plant comprising:

a vessel having a substantially flat, bottom wall and a substantially cylindrical side wall and defining an aeration chamber into which the wastewater flows to be exposed to aerobic bacteria to [convert] aerobically digest the organic solids in the wastewater [to water and CO₂, said aeration chamber having a bottom and side walls]

[means for injecting an oxygenation gas into the wastewater in the aeration chamber to support growth of the aerobic bacteria], and

a clarifier chamber in which wastewater from the aeration chamber flows upwardly toward an outlet pipe through which the wastewater flows from the wastewater treatment plant, said clarifier chamber being defined by a partition disposed in said vessel, said partition being in the form of an inverted, truncated cone into the bottom of which the wastewater flows from the aeration chamber,

the improvement comprising means for injecting an oxygenation gas and generating a wastewater current pattern in the aeration chamber from an aeration area [the current flowing upwardly from a position] close to the bottom and the side wall of the [aeration chamber] vessel, the current pattern having at least one first component flowing upwardly in a direction perpendicular to the bottom wall of the vessel [aeration chamber] and [parallel to] adjacent the side wall of the vessel [aeration chamber], second and third components that flow in opposite directions [then] around the partition which defines the clarifier chamber, a fourth component that flows [then downwardly] ^{AND 6TH & 7TH} ~~AND 6TH & 7TH~~ along the opposite side wall to the bottom of the aeration chamber, a fifth component that flows [and then] across the bottom under the opening to the clarifier chamber, and sixth and seventh components that flow in opposite directions [and] around the side wall of the vessel [aeration chamber] adjacent the bottom wall of the [chamber] vessel to keep solids from settling on the bottom of the aeration chamber.

9. (Thrice Amended) An aerobic wastewater treatment plant comprising:

an aeration chamber containing aerobic bacteria into which wastewater [containing organic solids] flows to be exposed to aerobic bacteria to [convert] digest the organic solids in the wastewater [to water and CO₂], said aeration chamber having a substantially flat, bottom wall and a substantially cylindrical side wall[s].

E7 [means for injecting an oxygenation gas into the wastewater in the aeration chamber to support growth of the aerobic bacteria,]

a clarifier chamber into which wastewater from the aeration chamber flows upwardly toward an outlet pipe through which the wastewater flows from the wastewater treatment plant, said clarifier chamber being defined by a partition in the form of an inverted, truncated cone into the bottom of

which the wastewater flows from the aeration chamber, said bottom wall providing a substantially planar surface under said partition.

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[a diffuser] an aeration system for releasing an [the] oxygenation gas as bubbles into the aeration chamber of the wastewater treatment plant, said aeration system [diffuser] providing an aeration area and sufficient flow such that all solids suspended within the plant are forced into [circulation] a circulation pattern, said [diffuser] aeration system being placed close to the bottom of the aeration chamber of the wastewater treatment plant and close to the side wall of the aeration chamber, said [diffuser] aeration system providing sufficient oxygenation gas to allow the aerobic bacteria to [convert] digest the solids in the wastewater [into CO₂ and water] and a current pattern having at least one first component flowing upwardly in a direction perpendicular to the bottom wall of the vessel and [parallel to] adjacent the side wall of the vessel, second and third components that flow in opposite directions around the partition which defines the clarifier chamber, a fourth component that flows along the opposite side wall to the bottom, a fifth component that flows across the bottom under the opening to the clarifier chamber, and sixth and seventh components that flow in opposite directions adjacent the bottom wall of the vessel.

10. (Thrice Amended) An aerobic wastewater treatment plant comprising:
an aeration chamber into which the wastewater flows to be exposed to aerobic bacteria to aerobically digest [convert] the organic solids in the wastewater [to water and CO₂], said aeration chamber having a substantially flat, bottom wall and a substantially cylindrical side wall[s].
[means for injecting an oxygenation gas into the wastewater in the aeration chamber to support growth of the aerobic bacteria.]

[a current in the aeration chamber, the current flowing upwardly from a position close to the bottom and the side wall of the aeration chamber in a direction perpendicular to the bottom of the aeration chamber and parallel to the side wall of the aeration chamber then around the partition which defines the clarifier chamber, then downwardly along the opposite side wall.]

a clarifier chamber in which wastewater from the aeration chamber flows upwardly toward an outlet pipe through which the wastewater flows from the wastewater treatment plant, said clarifier chamber being defined by a partition in the form of an inverted, truncated cone into the bottom of which the wastewater flows from the aeration chamber, and

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means for injecting an oxygenation gas and generating a wastewater current pattern in the aeration chamber, the current pattern having at least one first component flowing upwardly in a direction perpendicular to the bottom of the aeration chamber and adjacent the side wall of the aeration chamber, second and third components that flow in opposite directions around the partition which defines the clarifier chamber, a fourth component that flows downwardly along the opposite side wall to the bottom, a fifth component that flows across the bottom under the opening to the clarifier chamber, and sixth and seventh components that flow in opposite directions around the side wall of the aeration chamber adjacent the bottom of the chamber to keep solids from settling on the bottom of the aeration chamber.